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Reconnaissance Level Characterization Report For The Building 779 Cluster

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RECONNAISSANCE LEVEL CHARACTERIZATION REPORT FOR THE BUILDING 779 CLUSTER

REVISION 0

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This Reconnaissance Level Characterization Report has been reviewed and approved by

Mark Hickman, Project Manager	Date
Juan Hernandez, ESH&Q	Date
Brian Henderson, Project Engineer	Date
Gary Guinn, Environmental Compliance	Date
Ruth McCafferty, Health and Safety Representative	Date

This Reconnaissance Level Characterization Report was prepared by

Mary T Aycock, Environmental Engineer, SEG, CO	Date

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ACRONYMS

A/B	Alpha/Beta
ACM	Asbestos Containing Material
ALARA	As Low As Reasonably Achievable
ARARs	Applicable or Relevant and Appropriate Requirements
CFR	Code of Federal Regulations
COC	Chain of Custody
D&D	Decontamination and Decommissioning
DOE	U S Department of Energy
DOE/RFFO	DOE/Rocky Flats Field Office
DOT	Department of Transportation
DQO	Data Quality Objective
EPA	U S Environmental Protection Agency
GC	Gas Chromatograph
GC/MS	Gas Chromatograph/Mass Spectrometer
H&S	Health and Safety
HAZCAT	Hazardous Category
HEPA	High Efficiency Particulate Air
HSP	Health and Safety Plan
HVAC	Heating, Ventilating, Air Conditioning
HWP	Hazardous Work Permits
IDL	Instrument Detection Limit
IWCP	Integrated Work Control Program
LCS	Laboratory Control Sample
LEL	Lower Explosive Limit
LLW	Low Level Waste
MAA	Material Access Area
MDA	Minimum Detectable Activity
MSDS	Material Safety Data Sheet
NIOSH	National Institute of Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Act
PCB	Polychlorinated Biphenyl
pH	Symbol to express acidity and/or alkalinity on a scale of 0 to 14, with a pH of 7 being pure water, a pH of less than 7 being acidic, and a pH greater than 7 being alkaline
PPE	Personal Protective Equipment
Pu	Plutonium
QA	Quality Assurance
QAPjP	Quality Assurance Project Plan
QC	Quality Control

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RAD	Radioactive
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RFA	Request for Analysis
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RMRS	Rocky Mountain Remediation Services, L L C
RWP	Radiological Work Permit
SNM	Special Nuclear Materials
TCLP	Toxicity Characteristic Leaching Procedure
TIC	Tentatively Identified (organic) Compounds
TRU	Transuranic
VOC	Volatile Organic Compound
WBS	Work Breakdown Structure
WM	Waste Management
WSP	Work Summary Plan

RECONNAISSANCE LEVEL CHARACTERIZATION REPORT

1.0 INTRODUCTION

Due to the change in mission of the Rocky Flats Environmental Technology Site (RFETS) from the production of nuclear components to environmental cleanup and shutdown, Building 779 and its associated facilities have no identified mission after Fiscal Year 1996 It has, therefore, been determined by site management that the Building 779 cluster should be decommissioned to a safe and stable configuration to reduce operating costs and hazards

1 1 PURPOSE

No mention of samples + purpose of sampling

The purpose of this Reconnaissance Level Characterization Report is to present all of the available historical data and process information pertaining to the Building 779 Cluster consisting of buildings 727, 729, 779, 780, 780A, 780B, 782, and 783 through 787 This effort was to identify the type, quantity, condition, and location of radioactive and hazardous materials which are, or which may be, present as residual contamination in the subject facilities The compilation of facility information contained herein, in conjunction with the Building 779 project files established during this investigation, brings together pertinent data from various sources to serve as a practical reference for project use during the decontamination and decommissioning efforts

1 2 SCOPE

This report is prepared in support of the Building 779 Characterization for the U S Department of Energy (DOE) at the RFETS located near Golden, Colorado The information presented in this report specifically pertains to the Building 779 Cluster, the review of historical records and the collection of process knowledge information covers the operational time period for the facility from original construction to present

1 3 SUMMARY

A detailed examination of process knowledge and documents, relating to the Building 779 Cluster initiated in September 1996, has been performed As part of this examination, a comprehensive survey of historical records was undertaken to determine the location and character of any radioactive and hazardous contaminants which may be present in the area A room by room tabulation of relevant process knowledge and characterization information is presented in section 4 0 The general conclusions drawn from this examination are as follows

1 3 1 The Building 779 Cluster

Presently, the Building 779 Cluster is in a safe shut-down condition All required utility services (i e , electrical service, water supply, and natural gas supply) are active Building air ventilation and High Efficiency Particulate Air filtered exhaust systems, instrument air supply compressors, and required radiological monitoring instrumentation systems are in normal continuous operation All manually-actuated and automated fire/alarm suppression systems are operational All installed facility security and radiological alarm systems are normal All remote-handling mechanisms and auxiliary facility support equipment are operational or are available for activation and use

The Building 779 Cluster presently houses a significant quantity of materials and equipment which are radioactive, radioactively-contaminated, and/or contain hazardous materials

Building 779 was used for research and development in support of nuclear weapons production Although a wide variety of plutonium (Pu) activities were conducted in the building, large quantities of Pu were not processed Areas of Pu holdup within the building have been identified and the areas with significant quantities will be cleaned up during the deactivation process One laboratory contains a gamma-cell experimentation device, which contains a radioactive cobalt 60 source

Contamination is expected from Pu, beryllium, uranium, and other materials processed in Building 779 In addition, a wide variety of chemicals were used for laboratory tests Many of these chemicals still remain in the building and are planned for removal through the deactivation process

Page 13 RLCP Conflict

Machine, hydraulic, lubricating oil, and greases exist in various machines in Building 779 Polychlorinated Biphenyls (PCBs) are also likely to be encountered in equipment and electrical devices Due to the age of the facility, considerable amounts of asbestos are present in the insulation and building materials Lead is also present in the glovebox shielding and in some of the building materials Chemical symbols and compounds referenced in this report are presented in Table 1-1

1 4 METHODOLOGY

The general methodology employed for the preparation of this report involved the identification, location, collection, and review of available records which contain the Building 779 Cluster information The information sources examined, in the course of this effort, are listed in Section 5 0

The information collection process also included the gathering of first-hand process knowledge by direct conference with RFETS employees with applicable Building 779 experience The specific individuals interviewed, in the course of this effort, are identified in the project files

As part of this investigation, comprehensive physical inspections of all accessible areas of the Building 779 Cluster were conducted during the months of October and November 1996 and will continue as decommissioning progresses The primary purposes of these inspections were

- To confirm the accuracy of file documentation pertaining to as-built or modified facility construction equipment installations and general facility conditions This was further documented by taking pictures of areas to be included in the work packages to supplement the as-built drawings

- To confirm and correct the accuracy of current facility inventory records pertaining to source and radioactive materials, special nuclear materials (SNM), hazardous materials, facility-related equipment items, and to obtain volume estimates for wastes which will be generated during decommissioning activities

- To locate, identify, and document any facility condition or problem situation which had not been previously identified or otherwise documented in appropriate building records or files

- To identify equipment, structures, process lines, and associated items which will require field surveys and/ or analytical sampling for the purposes of further characterization of the Building 779 Cluster for radioactive and hazardous materials These sampling activities will be conducted prior to and during decommissioning efforts and are identified in detail in Section 4 0

What sampling was done in accordance with the RLCP? Why wasn't it described in the methodology?

Table 1-1 Chemical Symbols and Compounds

Symbol	Definition
B	Boron
Be	Beryllium
BeO	Beryllia, (Beryllium Oxide)
C	Carbon
CD	Cadmium
Ce	Cerium
Cr	Chromium
Cs	Cesium
Cu	Copper
Eu	Europium
I	Iodine
Kr	Krypton, (As Gaseous Fission Product)
Na	Sodium
Nb	Niobium
O	Oxygen
Pb	Lead
Pu	Plutonium
Rb	Rubidium
Ru	Ruthenium
Sb	Antimony
SiC	Silicon Carbide
^{90}Sr-^{90}Y	Strontium-90/Yttrium-90, In Equilibrium
T	(Atomic) Tritium, (Hydrogen-3)
Ta	Tantalum
Th	Thorium
ThC_2	Thorium Carbide
ThO_2	Thoria, (Thorium Oxide)
Tl	Thallium
U	Uranium
UC_2	Uranium Carbide
U, Depl	Depleted Uranium, (Usually $\leq$ 0.20% Enr)
U, Nat	Natural Uranium, (0.72% Enr)
UO_2	Uranium Oxide

2.0 BUILDING 779 CLUSTER DESCRIPTION

This section describes the Building 779 Cluster and all associated areas and utilities

2 1 SUMMARY DESCRIPTION OF THE BUILDING 779 CLUSTER

Main structures in the Building 779 Cluster are The development facility, Building 779, a filter plenum and emergency generator building, Building 729, a filter plenum building, Building 782, the emergency generator facility, Building 727, a paint storage facility, Building 780, and a cooling tower, Structure 783 Building 779 was built in 1965 and has had several additions and modifications since then Building 779 is located in the north central section of the RFETS, east of Buildings 776/777 and north of Building 750

During 1988, the exterior containment of Building 779 was structurally upgraded to withstand a Design Basis Earthquake and Design Basis Wind

Building 779 was a facility for research and development activities in physical chemistry, physical metallurgy, machining and gaging technology, joining technology, and process development The facility supported weapons production activities and was an essential component of the national security operations performed at Rocky Flats The areas in which these operations were located are described below

2 1 1 Description Of Facility

This section describes the physical arrangement of principal buildings in the Building 779 Cluster, their architectural and structural features, significant equipment, environmental control systems, and safety aspects of each The original Building 779 (1 in Figures 2-1 and 2-1 1) has been in use since May 1965 Since then, two major additions have been constructed The first addition (2 in Figures 2-1 and 2-1 1), also referred to as Building 779A, was built in 1968 The second addition (3 in Figures 2-1 and 2-1 1 was built in 1973 and is also referred to as Building 779B Two new filter plenum buildings for the Cluster were constructed Building 729 in 1971 and Building 782 in 1973

2 1 2 General Description

Building 779 is the primary structure in the Cluster Ground-floor area (including a covered dock) is 42,800 square feet (ft^2), the second floor is 24,370 ft^2, and the basement is 540 ft^2, for a total of 67,710 ft^2 The building is roughly L-shaped The north-south leg is approximately 161 ft wide and 214 ft long The east-west leg is 62 ft wide and 101 ft long At its highest, the building is 27 ft high

Building 729, one of the two filter plenum buildings for Building 779, is rectangular in shape, 72 ft long (east-west), 38 ft wide, and 30 ft high It is located south of Building 779 and is connected to it via a second-story, 8 ft wide duct bridge

Building 782 is the other filter plenum building for Building 779 It is 60 ft wide by 99 ft long (north-south) and is located east of Building 779 The building is 20 ft high It is connected to Building 779 via a combination of an underground duct tunnel, a two-story vertical shaft, and an overhead duct

The emergency generator for Building 782 is in a separate concrete block structure, Building 727, east of Building 779 and north of Building 782

A cooling tower, Building 783, is located east of Building 779 and north of Building 727

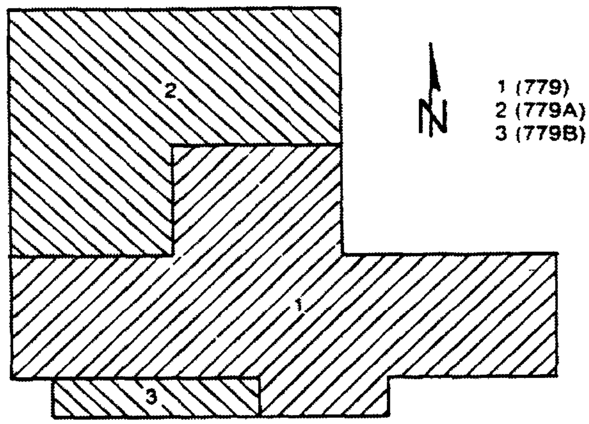

Figure 2-1 First Floor Key Plan, Building 779

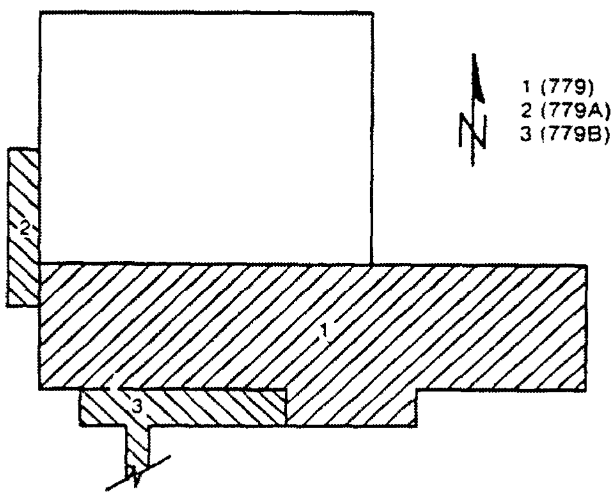

Figure 2-1.1 Second Floor Key Plan, Building 779

A paint storage facility, Building 780, is a sheet-metal shed located east of the northeast corner of Building 779

In addition to the structures mentioned, heating, ventilating, air conditioning (HVAC), electricity, gas and compressed air, steam, water, process waste, sewer, fuel oil, and fire protection utility systems serve the Cluster

2 1.3 Building 779 Description

Primary functions of Building 779 are research and development There have been two major additions to the building The first addition (Building 779-2) provided supplemental office, laboratory, and mechanical equipment space Also, two large machine shop areas were added The second addition (Building 779-3) supplied more office and laboratory space, plus an environmental storage facility and a storage vault

First- and second-floor plans for Building 779 are shown in Figures 2-2 and 2-3 The facility has joining, coating, and electroplating laboratories, machine shops, environmental storage areas, facilities, offices, loading docks, locker rooms, a duct tunnel to Building 782, a second floor enclosed walkway to Building 777, and a second-floor duct bridge to Building 729

2.1 3.1 Foundations

Foundations for Building 779 are horizontal, poured-in-place, reinforced concrete spread footings Dimensions vary from I ft 6 in square to 6 ft 6 in square and from 10 in to 16 in thick In depth below grade, they vary from 3 ft to 9 ft Reinforced concrete grade beams, 16 in to 18 in wide and 10 in to 13 in thick, rest on the spread footings Concrete grade walls 10 1/2 in to 12 in thick and 4 ft 6 in deep support the exterior walls

2 1 3 2 Structural Framing

Three types of framing members are used in Building 779 Vertical concrete columns, cast-in-place and reinforced, 10 in by 14 to 16 in rectangular, rest on slab footings Structural steel columns, 8-in - deep, wide-flange I-beams encased in concrete, support an exterior passageway and an exterior wall of the original building Concrete block pilasters, 16 by 16 in , reinforced with steel, are used in the single-story portion of the original building

2 1 3 3 Exterior Walls

Exterior walls of Building 779 are hollow concrete block except for the 12-in -thick, poured-in-place, reinforced concrete wall of the storage vault and the metal stud and siding on a storage area on the east side of the first addition (Building 779-2) Concrete block walls are 10 to 12 in thick for the first floor and 8 in thick for the second floor There is horizontal trussed wire reinforcement in both interior and exterior hollow core concrete block walls, however, there is no vertical reinforcement Walls are insulated with either perlite fill between cavities or 2 in blanket insulation Outer surfaces of the blocks are painted The walls are designed to be the equivalent of 2-hr fire-rated walls

2 1.3 4 Floors

First-floor slabs in Building 779 are poured-in-place, reinforced concrete 6 to 8 in thick, with a barrier on a gravel base The second-floor slab in the original building is 3 1/2-in -thick reinforced concrete on concrete joists supported by concrete beams The second-floor slab of the second addition is 8-in -thick reinforced concrete on concrete joists supported by concrete beams

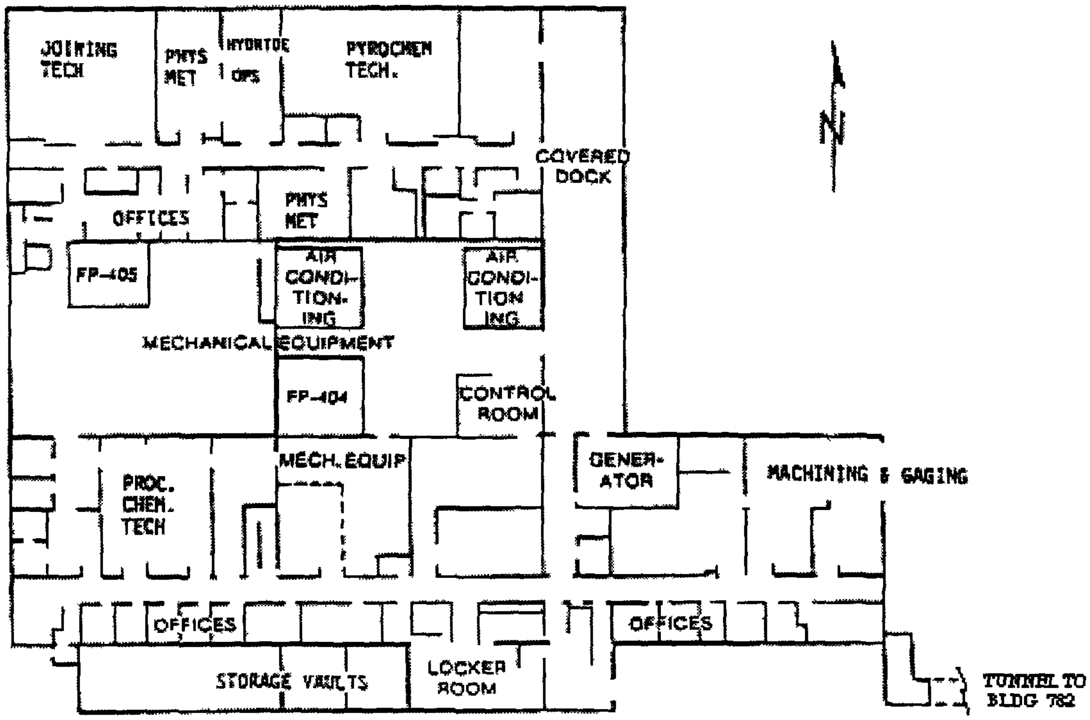

Figure 2-2 First Floor Plan, Building 779

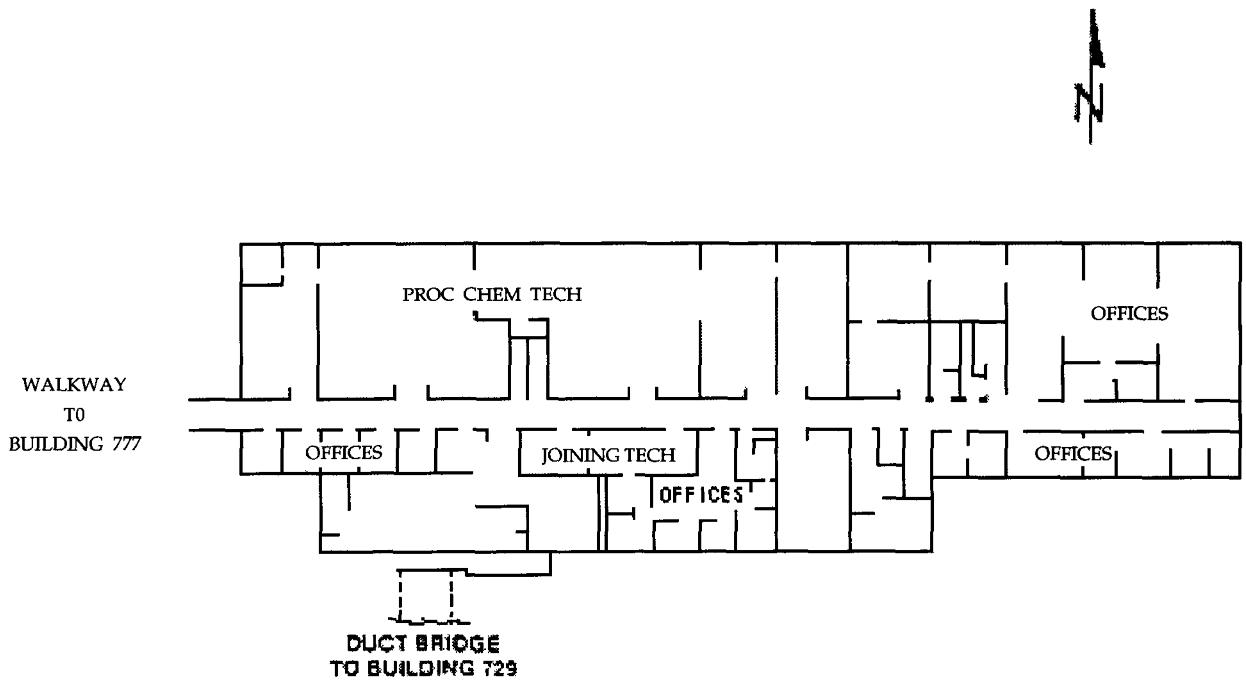

Figure 2-3 Second Floor Plan, Building 779

2 1 3 5 Roofs

Three different roof systems are used on Building 779 The single-story portion of the original structure (I in Figure 2-1) is structural steel with 18-gage steel decking, insulation, and composition roofing The two-story portion of the original building and the second addition is a poured-in-place, reinforced concrete slab on concrete joists, supported by concrete beams The original building roof has insulation and composition roofing, whereas the second addition roof has 2 in of foamed-in-place urethane and silicone rubber roofing The first addition roof consists of precast concrete tees with 2 in of light-weight concrete, 4 in of perlite, and elastomeric roofing

2 1 3 6 Interior Walls

Most interior and exterior walls in Building 779 are painted concrete block Storage vault walls, which are of 12-in -thick reinforced concrete, are also painted Ceramic tile covers the block in locker room and rest room areas The interior surface of most exterior walls is gypsum board

2 1 3 7 Ceilings

Ceilings in offices and hallways are suspended acoustical tile Elsewhere in Building 779 the ceilings are the undersides of floors and roofs The major exception is an 8-in reinforced concrete ceiling over the storage vault

2 1 3 8 Doors

Most of the doors in Building 779 are either solid steel, steel with louvers, or steel with safety glass windows There are double airlocks separating laboratory and development areas from the outside, office and maintenance areas There are two steel vault doors for the environmental storage area and a lead-lined, 4-in -thick Benelex~door for the storage vault

2 1 3 9 Windows

There are few windows in Building 779 The addition (Building 779-3) on the south side of Building 779 (Figure 2-1 1) resulted in the walling over of most of the original windows However, some windows remain on the south-east end of the building where the offices are four on the first floor and seven on the second

2 1 3 10 Surface Finishes

Most interior and exterior walls in Building 779 are painted Walls in laboratory areas are painted with epoxy Walls and floors in rest rooms and locker rooms are covered with tile Floors in laboratories are painted with epoxy and the floors in offices and hallways are vinyl asbestos tile

2 1 3 11 Duct Bridge to Building 729

The duct bridge is an enclosed second-story structure from Building 779 to Building 729 The interior of the bridge is 6 ft 8 in wide by 7 ft 4 in high and spans 38 ft between buildings The floor is precast concrete twin tees with a concrete overcoat Walls are concrete block and the roof is 4-in -thick, reinforced concrete with 2-in , foamed-in-place insulation and silicone-rubber roofing

This bridge houses the two exhaust ducts from Building 779-3 There is not a walkway from one building to the other through the bridge

2 1 3 12 Overhead Passage to Building 777

The connecting, enclosed walkway from the second floor of Building 779 to Building 777 is approximately 11 ft wide by 54 ft long It has a reinforced concrete floor and roof and concrete block walls The roof is insulated and has built-up roofing on top

2 1 3 13 Exhaust Duct Tower

The tower structure for the exhaust ducts to Building 782 is located along side Building 779 at the southeast corner It is 40 ft high and approximately 12 by 13 ft in cross-section Walls are 8-in -thick, reinforced concrete block The roof is tapered, reinforced concrete slab with 8 in at the high point and 5 in at the low end The roof slab is on top of a metal deck and is covered with built-up roofing material on top of 1 1/2 in of insulation

2 1 3 14 Duct Tunnel to Building 782

Exhaust ducts enclosed in a tunnel run east on the roof of Building 779, pass into the duct tower off the southeast corner of the building, down through the tower, and into a 48-ft-long underground tunnel, entering Building 782 in the pit area (Section 1 2 3 5)

The underground duct tunnel is 10 ft 8 in wide and 12 ft high on the inside Walls, floor, and roof are 12-in -thick, reinforced concrete with an exterior waterproofing The top of the roof slab is about 3 ft below grade Walls are supported by five concrete caissons 2 ft to 2 1/2 ft in diameter and 11 to 14 ft deep

2 1 3 15 Arrangement of Building 779

The L-shape of Building 779 is comprised of three main areas (Figures 2-1 and 2-1 1)

Section I is the original building and is two stories On the first floor are laboratories, a mechanical equipment room, a maintenance room, an emergency generator, and welding areas There is also a locker room, offices, Radiation Monitoring, and other small shop areas The second floor has two large laboratory areas containing Coatings R&D, x-ray, gas diffusion, offices, and small laboratories There is also a small basement for process waste collection tanks, a fire protection water collection tank, and transfer pumps

Section 2 has five large research areas for metal joining, electroplating, and machining Smaller areas contain facilities for measurement, mechanical properties, and physical evaluation Offices, a locker room, and a mechanical equipment room are also located in this section

Section 3 is the second addition to the building and is two stories located at the southwest corner of the building It houses a mass spectrometer surveillance lab and an environmental storage area

2 1 4 Emergency Generator Facility, Building 727

The emergency generator facility houses a 500-kilowatt (kW) generator for emergency power for Building 782 The structure, built in 1973, is 16 ft wide by 24 ft long by 12 ft high The single-story building has 8-in concrete block walls that rest on 8-in -thick by 5-ft-deep foundation walls Block walls support a 5-in -thick, reinforced concrete roof slab that has asphalt-gravel roofing The floor slab is 6-in -thick, reinforced concrete Access is provided by a set of double doors and a single door Ventilation is provided by six louvered grills This building has automatic sprinklers with an antifreeze solution, and an electric space heater for winter freeze protection

2 1 5 Filter Plenum Facility, Building 729

Constructed in 1971, this is a one-story building with a small penthouse that serves as the connection for the exhaust-duct bridge from Building 779 The building is approximately 72 ft long by 38 ft wide by 16 1/2 ft high The penthouse is 22 ft by 10 ft and 7 ft 4 in high Building 729 contains two filter plenums, a two-stage and four-stage, that filter room and glovebox air from Building 779-3 There is also a 150-kU emergency diesel generator used for critical equipment within Building 729 during power failure

Reinforced concrete spread footings, 2 ft by 3 ft 4 in by 1 ft thick, support reinforced concrete grade walls 13 to 19 in thick and 3 to 5 ft deep The floor slab is reinforced concrete 6 in thick There are two -pits one is approximately 2 1/2 ft deep, the other is approximately 6 ft deep Both pits are lined and have 12-in -thick floor slabs The pits were constructed to hold waste fire water that could be contaminated Figure 2-4 illustrates the first floor plan of the building

Outside walls are actually two separate walls two inches apart, made of concrete block The exterior wall is 4 in thick and the interior wall is 6 in thick with 2 in of loose perlite between the walls

The roof consists of precast concrete twin-tee joists topped with a 4-in -thick concrete slab, 2-in -thick foamed-in-place urethane, and finished with silicone rubber roofing It is supported by cast-in place concrete beams resting on reinforced concrete columns

There is a second-floor mezzanine above the control room in Building 729 The floor is a cast-in-place, reinforced concrete slab

For fire protection, the building has wet-pipe sprinklers throughout, heat detectors, and manual and automatic sprays in the plenum

2.1.6 Paint Storage Facility, Building 780

This building provides storage for paint and solvents It is a corrugated sheet-metal shed with a reinforced concrete slab floor and sheet-metal roof Interior walls and ceiling are gypsum board The building has approximately 140 ft^2 of space

2 1 7 Cooling Tower, Structure 783

The cooling tower, in use since 1967 and rebuilt in 1985, supplies cooling water to Building 779 Building 779-2 cooling water is supplied from the Building 776 system Structure 783 is constructed of aluminum and steel on reinforced concrete pedestals on a reinforced concrete foundation Since it consists entirely of metal and concrete, a fire protection system is considered unnecessary

2 1 8 Filter Plenum Facility, Building 782

This filter plenum facility serves the original Building 779 and Building 779-2 It has three exhaust plenums for building, glovebox, and hood exhausts, plus a supply plenum for Building 782 supply air The building has been in use since February 1973 It is 100 ft long by 61 ft 8 in wide by 15 ft 9 in high Figure 2-5 is a floor plan of the building

Reinforced concrete caissons, varying from 2 to 2 1/2 ft in diameter and from 6 to 24 ft deep, support reinforced concrete grade beams 10 in thick by 5 ft deep The floor slab is reinforced concrete varying from 6 to 9 in thick There is one large pit at the west side of the plenum building that holds the fire water waste tank and provides access through the duct tunnel to Building 779 The pit is 23 by 22 by 17 ft deep Walls are 12-in-thick, reinforced concrete and the floor is reinforced concrete 12 to 17 in thick Walls of Building 782 are 6-in thick, precast,

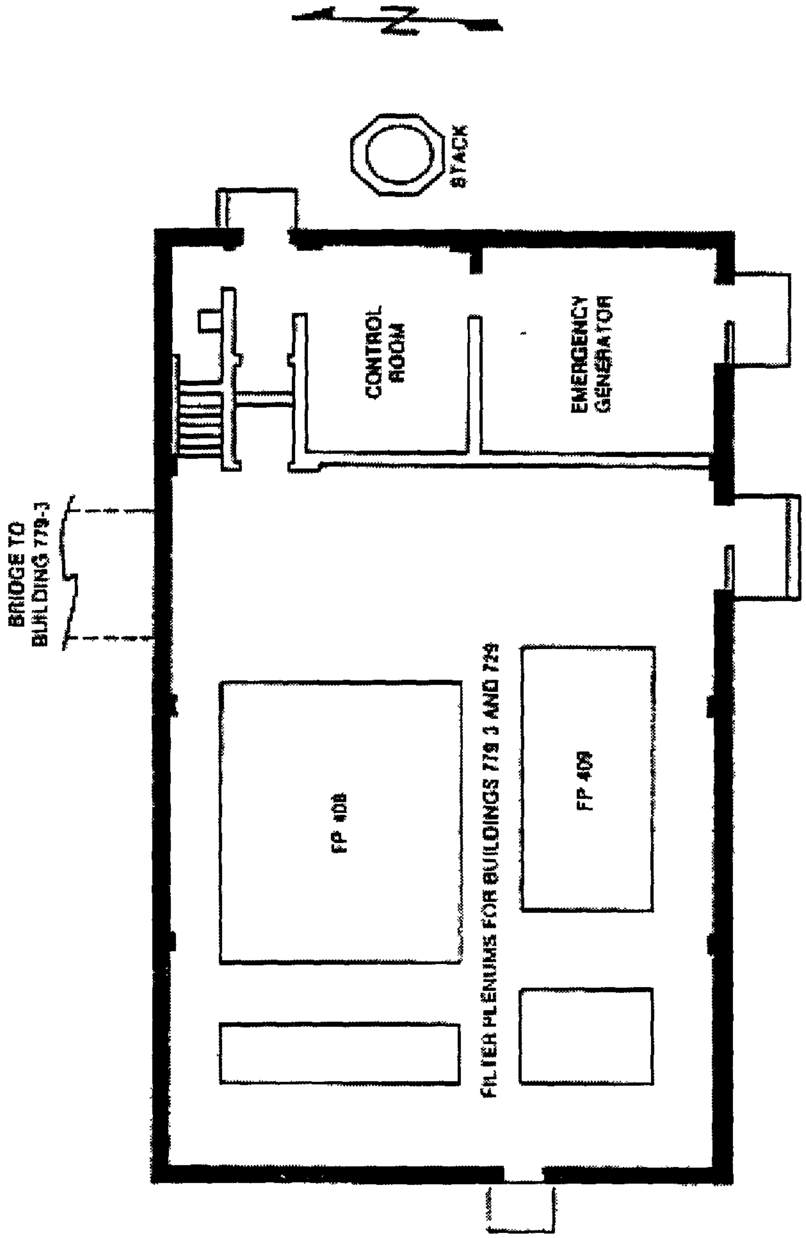

Figure 2-4 First Floor Plan, Building 729

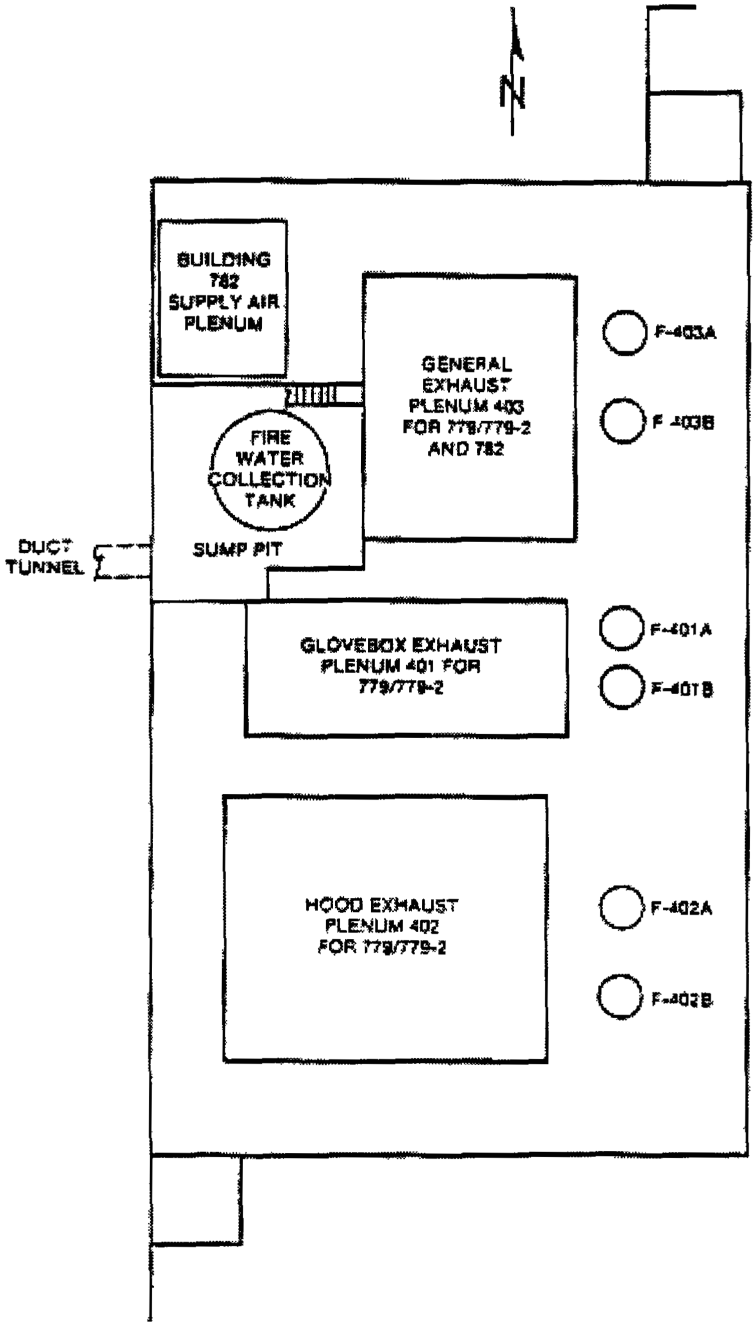

Figure 2-5 Floor Plan, Building 782

reinforced concrete panels keyed in place by 8-in-thick concrete columns that vary from 14 to 24 in wide There are no interior walls

The roof consists of precast, reinforced concrete twin tees with a minimum of 2 in of composite cast in-place, stone aggregate topping It is supported by 8-in -thick reinforced concrete roof beams resting on the reinforced concrete columns

Automatic sprinklers throughout the building, and heat detectors with automatic alarms to the Plant Protection Dispatch Center, provide fire protection for the building

2 1 9 Zone Concept for Confinement

For confining radioactive materials, Building 779 is divided into several zones separated by physical barriers Equally important is the control of building ventilation This is accomplished through a series of pressure-control zones, each of which is connected to dampers that control the amount of air leaving a zone Ventilation pressure is increasingly negative from zone to zone toward areas of potentially higher radioactivity The ventilation atmosphere flows from areas having the least potential for radioactivity toward areas having progressively higher potentials Definite pressure differentials are maintained between zones

The air-pressure balance between zones is maintained by differential-pressure sensing instruments and is controlled by inlet and outlet zone dampers Pressure differentials maintain airflow toward the zone having highest radioactivity potential to final filtration, prior to being exhausted to the outside atmosphere

The outer shell of Building 779 provides the final containment barrier for radioactive materials Conventional double-door airlocks provide passage to areas that do not contain radioactive materials, such as offices or maintenance shops

2.1.10 Glovebox Design

The primary confinement of radioactive materials in Pu process areas is achieved by the use of gloveboxes In general, process gloveboxes are of welded construction, using formed stainless steel sheet Some boxes are lined with Teflon® Gloveboxes are covered with l/8-in lead sheet where greater radiation shielding is required

Glovebox windows are attached by means of floating gaskets or external studs and clamping bars that seal suitable gaskets Windows are laminated safety glass, wire glass, or plastic, depending on conditions inside the box If shielding is required, leaded glass is laminated with safety glass Glove ports are stainless steel rings welded to glovebox walls Thick rubber gloves are attached to glove ports with steel rings Before they are used, gloveboxes are leak tested to ensure their integrity

Where possible, gloveboxes are designed with a single-level floor to prevent fissile material from accumulating in low areas or pockets Large openings in a glovebox, such as a ventilation duct, are positioned above the floor of the glovebox to prevent the entry of liquid Some gloveboxes that potentially could contain a critical quantity of fissile material have a gravity flow drainage system capable of removing liquid to maintain a critically safe depth Criticality drains terminate on the laboratory floor that is designed to hold the liquid in a critically safe configuration Liquid can then be sucked into special Raschig ring-filled vacuum tanks for subsequent analyses and processing

2 1 11 Heating, Ventilating, and Air Conditioning Systems

The purpose of the HVAC system is to control the temperature, humidity, and quality of the zone atmospheres within Building 779 The Building 779 Cluster contains several HVAC systems

Air supply systems are capable of conditioning 100% outside air, however, the systems usually operate in a recirculating mode to conserve energy Control rooms and instrumentation, operating under normal power, emergency power, or uninterruptible power, ensure safe, dependable surveillance and control of the HVAC systems

3.0 GENERAL OPERATING HISTORY

Building 779 was originally constructed in 1965 with additions added on in 1968 and 1973 for a total area of 67,710 sq ft , of which approximately 48,000 sq ft is included in the Material Access Area The primary function of the facility was one of research and development The facility was devoted to many phases of research with a variety of materials, which included not only Pu, but also uranium, beryllium, tantalum, and other exotic materials Activities conducted in the building throughout its history included those concerned with Pu chemistry, physical metallurgy, product integrity and surveillance, joining, coatings, and machining Typical research projects included the investigation of gas-metal interface reactions, thermodynamic measurements on Pu, electron-microscope investigations of metal structure, and the development of sophisticated joining techniques In all, there were 39 processes conducted in the building throughout its history

The east side of the building (on both the first and second floors) is not contaminated with radiological constituents This space (approximately 19,700 sq ft) contains office, machine shop, and loading dock areas If radiological constituents are discovered, a reevaluation of the work activities will be performed and adequate protective measures will be initiated

3.1 ASSOCIATED FACILITIES

Buildings 729 and 782 (constructed in the early 1970s) house filter plenums and contain radioactive contamination These buildings are 2,740 and 6,200 sq ft , respectively Of the support buildings, in the Building 779 cluster, the two plenum buildings will require the most work to deactivate Buildings 780 and 780A, which are used for miscellaneous storage, are constructed of corrugated metal and lumber Building 783, and it's associated fans, supply cooling water to Building 779

3 2 IDENTIFIED BUILDING HAZARDS

Building 779 was used for research and development in support of nuclear weapons production Although a wide variety of Pu activities were conducted in the building, large quantities of Pu were not processed It is anticipated that the holdup of radionuclide material will be found during deactivation One laboratory contains a gamma-cell experimentation device, which contains a radioactive cobalt 60 source

unknowns with 3.16

Contamination is expected from Pu, beryllium, uranium, and other materials processed in Building 779 In addition, a wide variety of chemicals were used for laboratory tests Many of these chemicals still remain in the building and are planned for removal through the deactivation process

Machine, hydraulic, lubricating oil, and greases exist in various machines in Building 779 PCBs are also likely to be encountered in equipment and electrical devices Due to the age of the facility, considerable amounts of asbestos are present in the insulation and building materials Lead is also present in the glovebox shielding and in some of the building materials PCBs/Pb in paint

3.3 DESCRIPTION OF OPERATIONS

This section describes the research, development, and support operations which were previously conducted in Building 779 Operations are separated into five areas of responsibility

1 Process Chemistry Technology

2 Physical Metallurgy

3 Machining and Gaging

4 Joining Technology

5 Hydriding Operations

Because research operations were constantly changing during facility operations, only a general description of them is provided

3 3.1 Process Chemistry Technology

The chemistry laboratories in Building 779 were engaged in weapons process development, stockpile reliability testing, and methods development for recovering, separating, and purifying actinides from waste streams and residues Some research activities and operations were performed on a continuous basis in production-scale facilities Other activities were short-term and were performed on a laboratory scale using more highly specialized equipment

Actinide elements, compounds, and other radioactive materials encountered include the following isotopes and other associated trace isotopes or radioactive decay products

- Americium
  Am-241
- Cobalt Co-60
- Plutonium
  Pu-238
  Pu-239
  Pu-240
  Pu-241
  Pu-242
- Strontium~Yttrium
  Sr-90/Y-90
- Thorium
  Th-232
- Tritium
  H-3
- Uranium
  U-235
  U-238

Chemicals not used in other parts of Building 779 were used in Process Chemistry Technology operations They included elemental iodine hydrazine, dimethylamine, ammonium hydroxide, soda lime, hydrochloric acid, alkali metals and compounds, and hydrogen

3 3 1 1 Ion Exchange

Ion exchange resins were tested for the purification and separation of Pu from other actinides Purified Pu eluate was returned to production for conversion to Pu metal Safe control of the ion exchange processes required proper sequencing of column feed adjustments, open-end columns for protection from pressure, specific instructions for eluting before the end of a work shift and never allowing resin to dry (nitrated dry resin is unstable), and safe-diameter columns and storage vessels

3 3.1 2 Precipitation

The Pu peroxide precipitation and calcination process was simulated on a laboratory scale The process converted Pu solutions to a Pu peroxide precipitate The precipitate was then calcined to a Pu oxide powder, which is transferred to Building 771 for reduction to metal The process required critically safe operating and storage vessels

3 3 1 3 Thermodynamics

Thermodynamics studies of nuclear materials were conducted on a laboratory scale Experiments involved measurement of chemical energy changes associated with certain chemical reactions, as well as the determination of heat capacities and enthalpies of nuclear materials, some of which were radioactive

Solvent extractants were tested for the separation and removal of actinides from acid and salt wastes Aqueous and organic wastes were transferred to Waste Operations for disposal Solvent extraction involved contacting aqueous and organic phases in small vials and used nonfriable or high-flashpoint solvents for safety

3 3.1 4 Thermogravimetric Analysis

Equipment is in place which was used for characterizing solids and their interactions and reactions with solids and vapors at subatmospheric pressure and at subzero, ambient, and high temperature These capabilities used both vacuum microbalances and differential thermal analysis and thermogravimetric equipment Specific measurements included (1) determining surface area of powders, (2) measuring adsorption and desorption of gases from solid surfaces, (3) measuring the kinetics of solid-gas reactions, (4) measuring equilibrium vapor pressures, and (5) defining the pressure-temperature composition relationships and phase equilibria of solid-gas systems Radioactive, nonradioactive, and air sensitive materials were studied Sample sizes were generally less than 5 grams

3 3 1 5 Surface Studies

Methods used to study the surface of solid samples included auger electron spectroscopy, low energy electron diffraction, electron spectroscopy for chemical analysis, and ellipsometry Both radioactive and nonradioactive materials were examined

3 3 1 6 Radiation

Effects of radiation on various solids, liquids, and gases were considered, using gamma, beta, and alpha irradiation sources These studies determined the radiation stability of materials used in a number of production operations at Rocky Flats Detailed planning of experiments, use of protective equipment, and radiation shielding helped ensure the safety of these experiments

3 3 1 7 Compatibility

Compatibility and chemical studies were performed with Pu and uranium samples Equipment used in these tests included pressure volume-temperature systems, dynamic gas analyses systems, and high vacuum, gas, and acid-handling systems The laboratory performed kinetic tests and, using gravimetric methods, tests for corrosion These sometimes involved chemical reagents not normally used in other operations in the building

Experiments were carefully planned to ensure that they were conducted safely The systems used were leak and pressure tested The systems had burst discs, check valves, and in-line particulate filters Experiments were conducted in gloveboxes having atmospheres with less than 3% oxygen Adequate radiation shielding was provided

3.3 1 8 Product Testing and Surveillance

This area included process development research, production support experimentation, and stockpile reliability evaluations Process development was performed in response to design agency guidance related to various phases of weapon cycle use (production, stockpile, deployment, command and control, surveillance, and site-return evaluation) These processes, typically, involved coupon-size samples used for determining reactivity and reaction mechanisms

Production support experimentation was typified by testing of materials proposed for production use Each material was tested for compatibility with war reserve metals and other production materials before it was approved Experimentation for these determinations was performed using small samples that were stored for several weeks Full scale pit testing was performed in response to specific design agency requests

Product was tested under a variety of field-simulated conditions of temperature, pressure, and chemical environment This area of work included short-term operational cycle experiments, as well as accelerated aging studies and subzero temperature shelf-life testing

Operational-cycle-experiments were done under controlled conditions using gas-tight, vacuum and high pressure metallic systems Product aging and shelf-life testing were accomplished in a DOE-approved nuclear materials storage and vault facility

3 3.1 9 Evaporative Separation

A high-temperature furnace was used to develop methods for distillation of salts and volatile metals from Pu and americium alloys and residues Volatile metals were mostly zinc and magnesium This process was a tool for purifying alloys and upgrading salt residues

3 3 1 10 Pyrochemical Processes

Pyrochemical Process Development was associated with production equipment and production process applications of the pyrochemical techniques This group experimented with molten salt extraction, salt sparging, direct oxide reduction, and electrorefining

Molten salt extraction was performed to remove impurities (i e , undesirable radionuclides) from Rocky Flats Pu The molten salt extraction operation was performed at an elevated temperature to melt the Pu metal Molten metal was combined with a salt mixture that contained magnesium chloride, which served to oxidize the impurities in the Pu metal Once molten, the mixture was separated into a salt phase (which contained the impurities) and a metal phase Upon cooling, the salt was removed and processed for reuse The purified Pu button was returned to production

Spent salts from molten salt extraction were melted and combined with calcium metal to reduce the Pu and americium contained in the salt to pure metal form A calcium/Pu/americium alloy resulted, along with the purified salt The salt was either reused or discarded if Pu levels were low enough The metal alloy button was further treated by vacuum melting, which drove off the more volatile nonradioactive metal components, resulting in a purified Pu/americium button, which could be separated by a variety of processes, including molten salt extraction as described above

Direct oxide reduction was a one-step process for converting Pu oxide into Pu metal PuO_2, calcium chloride, and calcium metal were placed into a crucible and melted The molten mixture was stirred to allow the reduction reaction to take place The molten products were then poured into mold and allowed to cool Breakout of the cooled contents yielded a Pu metal button and a discardable salt

Electrorefining was another method of Pu purification based on the mobility of Pu ions in the presence of an electric current Pu was heated to a molten state in the presence of molten salt A direct current source is applied to the molten mixture through a tantalum anode placed in the mixture The molten metal mixture acted as the anode Pu ions collected at the cathode and were reduced to pure Pu metal Impurities remained in the molten salt phase The resultant Pu metal was returned to production, and the spent salt was sent to salt sparging for reprocessing

3 3 2 Physical Metallurgy

Physical Metallurgy conducted research on various metals, alloys, and materials required by plant missions The group also supported different research groups, design agencies, plant production, and others in metallurgical studies of materials and manufacturing techniques for components and processes Support operations by the group included optical and electron metallography, microprobe analysis, X-ray diffraction, tensile testing, hardness testing, and dilatometry

Physical Metallurgy personnel experimented with small samples of metals, such as Pu, uranium, beryllium, steel alloys, copper, and various ceramics and glasses Laboratories with gloveboxes were used for handling radioactive materials Tensile testing and electron metallography facilities were housed in special laboratory rooms Below are some of the operations conducted by this group

3 3 2 1 Optical and Electron Metallography

Analysis of materials was made by examining their structures with light and electron microscopes Gram samples, which were usually mounted in plastic holders, were prepared by cutting or sawing Several cutting and sawing devices were used Beryllium and depleted uranium were handled in machines with hoods and air exhausts for protection against toxic dust and fumes while Pu samples were handled in gloveboxes Cutting fines were collected and stored in a drum, which was sent to Building 774 for disposal

Materials in plastic mounts were usually ground and polished in specialized metallographic equipment to yield a polished surface for examination Grinding was performed wet and the fines were constantly flushed into the process waste drain Usually, a chemical treatment followed to reveal the structure in detail Specimens were then examined in appropriate microscopes The internal structure of some materials was studied by preparing thin films of the material, and passing an electron beam through the film Specimens were returned to the originator, waste material was disposed of in waste collection drums

3 3.2 2 Microprobe Analysis

Samples of materials prepared metallographically, including freshly polished and clean Pu, were inserted in the microprobe chamber An electron beam scanned across the specimen was used to obtain a chemical analysis by determination of the spectra that were collected

3 3 2 3 X-Ray Diffraction

The atomic crystal structure of materials was examined by the use of X-ray diffraction Technical information was obtained by such X-ray studies Specimens of up to a few grams were placed in the X-ray beams Radioactive materials were covered with a thin plastic film for protection against contamination

3 3 2 4 Mechanical Testing

The mechanical behavior of radioactive or fissile materials was determined by use of a testing machine enclosed in a glovebox Nonradioactive materials were tested in open machines Materials were evaluated by the application of tensile, compressive, and shear loading Relatively small machined specimens were used for testing Radioactive materials were handled according to appropriate safety procedures

3.3.2.5 Dilatometry

Dimensional changes of a material were measured by use of a dilatometer that detected these changes as the material was heated and cooled. Machined specimens ~~were~~ small, and radioactive materials were tested in this system The dilatometer was contained within a glovebox

Rewrite

3 3 3 Machining And Gaging

Machining operations within the buildings were conducted in three shops, two general machine shops and a general machining laboratory located in original Building 779 and in Building 779-2

One general machine shop supports Joining Technology The work consisted of making tooling, fixtures, and special order parts of steel, cast iron, and other common materials Shop equipment included lathes, mills, tool grinders, a belt sander, and a power hack saw Standard shop practices, monthly safety inspections, and trained operating personnel provided a safe working environment Only non-nuclear material was handled (excluding beryllium)

The second general machine shop was a maintenance shop used in support operations It is equipped with a lathe, mill, drill press, and tool grinders General machining tasks employed common materials such as aluminum, brass, copper, and steel Again, only non-nuclear materials were handled

The general machining laboratory was used for high-precision machining of special orders, machining tests, and general machining jobs It was equipped with a direct numerically controlled lathe, tracer lathe, straight lathe, mill, jig borer, drill press, electrodischarge machine, bandsaw, surface grinder, monoset grinder, and tool grinders Waste generated in the machining of common materials was collected in drums in each shop and disposed of according to written procedures

3 3 4 Joining Technology

Joining Technology activities were conducted in original Building 779 and in Building 779-2 There was only one Joining area for the handling of nuclear material, which was in Building 779-2 Joining activities included electron-beam welding, gas-tungsten-arc welding, pressure gas-metal-arc welding, gas welding, brazing, metallography, machining, dimensional inspection, and electronics development

The Coatings facility in Building 779, has three hot-hollow cathode systems and associated hardware The function of this facility was to define the required parameters associated with the deposition of various materials onto specified substrate geometries The material most often

deposited was silver However, other materials, such as gold, silicon dioxide, and silicon monoxide, were also deposited

Substrate materials were usually Vascomax, steel, stainless steel, beryllium, and uranium-238, in a variety of forms At no time were the substrate materials mechanically worked on, as in sectioning or grinding, in this facility Coatings were deposited onto the substrates in a closed chamber and under partial vacuum

Each of the hot-hollow cathodes was contained in a separate high-vacuum chamber For any one system, vacuum pumps, gages, and necessary electronics were housed in a cabinet that also doubled as a table surface for the vacuum chamber

There are, at present, two power supplies being shared among the hot-hollow cathodes Both power supplies are enclosed in cabinets with safety interlocks on the panels and doors Although on-off switches are mounted on the cabinets, breaker switches on the wall are used as an additional precaution in initiating and shutting off current to the power supply

Hazardous materials used in the Coatings facility were methanol, nitric acid, and sodium hydroxide These materials were present in small quantities

3.3 5 Hydriding Operations

Hydride Operations received parts with recoverable Pu, and through the process of hydriding, removed Pu from the part in the form of Pu hydride This hydride was then dehydrided and converted to Pu metal or oxidized to Pu oxide

In the hydriding process, the procedure can vary depending upon the material being processed, however, the general procedure is outlined below The part was placed in the hydriding vessel, which was evacuated and backfilled with pure hydrogen In the hydriding reaction, the hydrogen gas in the vessel was consumed in the reaction, therefore, hydrogen was continuously added by an automatic controller to maintain proper operation pressures

Upon completion of the reaction, the hydride was placed in the oxidation reactor Oxidation occurred by passing air through the oxidation reactor When oxidation was complete, the material was burned in the presence of pure oxygen, to ensure that all the hydride was converted to oxide

Since the above reactions involved high temperatures, pyrophoric materials, and potentially explosive gases, several safety systems were designed to prevent any adverse consequences Both reaction vessels are contained within a glovebox that is inerted with argon This glovebox was monitored for high oxygen and hydrogen concentrations Additionally, the electrical design of the system made it impossible to perform the hydriding and oxidizing operations simultaneously Finally, if the pressure of the glovebox exceeded a set pressure, a pressure-relief valve would open, allowing pressurized gases to be exhausted through the hydrogen burning glovebox

4.0 RADIOACTIVE AND HAZARDOUS CHARACTERISTICS

Location-specific information concerning the characterization of each area of the Building 779 Cluster and each room in Building 779 is presented in this section This localized characterization includes descriptions of specific events, operations, installations, construction, equipment operation, and other process knowledge information relating to the Building 779 Cluster The information collected in this section has been obtained from several sources, including past/current records and RFETS personnel with relevant Building 779 Cluster work experience or related knowledge A complete listing of the information sources examined for this report is provided in Section 5 0

4 1 FACILITY WORK AREA

Building 779 has been divided into six work areas for the purpose of decommissioning The six areas are as follows

Area 1 - First-floor Rooms 146, 147, 149, 150, 151, 152, 153 (a & b), 154, 155, 156, 157, 158, 159, 160, 160a, 161, 163, 165, 167, and 167a

Area 2- Second-floor Rooms 215, 216, 217, 218, 219, 220, 221 (a, b, & c), 222, 222a, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 234a, 235, 273, 274, 275, and 277

Area 3- First-and second-floors Rooms 123, 124, 125, 128, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140 (a & b), 141 (a, b, & c) 171, 172, 173, 270, 271, and 272

Area 4- Rooms 121, 121a, 122, 123, and areas of the building not radiologically contaminated

Area 5- Rooms 001, 126, 127, and 142

Area 6- Support Buildings 727, 729, 780, 780a, 782, 783, and associated cooling towers

Although not all inclusive, the following list contains some of the hazardous materials which have been used in the 779 Cluster and will be addressed during the characterization of the 779 Cluster

- Acids (Nitric, Sulfuric, And Hydrochloric)
- Beryllium
- Kathene
- Cobalt 60 Source
- PCBs In Equipment
- Excess Chemicals
- Machine Oil
- Solvents
- Liquid And Solid Pu And Uranium Residue

An assessment of the hazards that may be encountered during specific decommissioning activities will be performed through walkdowns and job safety analyses This information will be incorporated into the planning process of each activity to ensure maximum protection of the worker

4 2 FACILITY CHARACTERIZATION

The following table is organized by decommissioning areas as described above and includes a description of the operation and process information available for each room and area, the materials that were used in the room based on historical information, the contamination considerations for each room, and the proposed confirmation analysis which will be performed prior to and during decommissioning activities to further characterize the facility, and wastes generated

The purpose of the proposed characterization activities is

1 to quantify and qualify the physical and chemical characteristics of radiological and hazardous material contamination and the extent of contaminant distribution,

2 to quantify and qualify parameters that effect potential human exposure from existing and residual radiological or hazardous material contamination,

3 to support evaluation of detailed planning of a preferred approach for decontamination, equipment removal and waste disposal, and

4 to support required project plan considerations of dose assessments and ALARA analyses to support selection of cleanup criteria and approach

Data collected during the characterization activities will consist of two types

1 field measurements using portable instruments or test kits and

2 sample analyses of media using fixed laboratory equipment or systems

Radiological surveys will be performed by trained Radiological Control Technicians using field instrumentation in accordance with the ROI Manual Lead test kits will be used as a preliminary screening test to verify the presence of lead Bulk samples will be collected, as necessary, for lead paint and for Asbestos Containing Material (ACM)

Table 4-1 "Building 779 Reconnaissance Characterization Table" lists the locations and the types of samples that will be required for characterization purposes A trained sampling team was selected to perform the sampling activities required for characterization purposes Analysis for characterization purposes will be performed using Environmental Protection Agency (EPA) approved procedures through laboratory facilities Data Quality Objectives are established for the analytical methods referenced and are on file at the on-site Analytical Projects Office (APO) in Building 881

Table 4-1 includes the room numbers associated with each area, process information regarding the processes conducted in each room, radioactive and/or hazardous considerations (i e , known materials associated with a specific process or area), and the proposed confirmation analysis to be performed Liquid samples will be collected by sampling teams and analyzed at the APO laboratories located on-site Hazardous Category (HAZCAT) kits will be used in the field, where possible, the designate pH for suspected acids and other chemicals In most cases, a gross Alpha/Beta screen will be performed for radioactive determination and a "fingerprint" analysis will be performed to screen for Resource Conservation and Recovery Act (RCRA) hazardous characteristics If liquids are found to be radioactive, they will be managed as Low-Level Waste (LLW) If liquids are found to test positive for any RCRA characteristics under the fingerprint analysis, further investigation or analysis will be performed to properly characterize and manage the waste under RCRA

5.0 INFORMATION SOURCES

The preparation of this report involved the retrieval, from various sources, and review of several documentation files pertaining to the Building 779 Cluster and past operations therein The following sections list the files that have been reviewed in the course of this reconaissance characterization

This investigation effort also included the collection of first-hand process knowledge interviews from RFETS employees with Building 779 experience A listing of personnel who contributed first-hand information is available in the project files

5 1 FACILITY RECORDS

The following Building 779 Cluster records are available for retrieval from the Building 779 Cluster Decommissioning Project Document Files

5 1 1 Building 779 Radiological Monitoring Contamination Survey Reports dated January 1990

5 1 2 Building 779 WSP BDP-779-003, Revision 0, Part A, September 9,1996

5 1 3 RFETS Glovebox Data List, dated October 1, 1996

5 2 NUCLEAR SAFETY AND COMPLIANCE RECORDS

5 2 1 Holdup MeasurementsRresults for Building 779, Safe Sites of Colorado Interoffice Correspondence, dated September 27,1996

5 2 2 Summary of Building 779 Pu Holdup Breakdown by System, DKS-001-93, EG&G Rocky Flats, Inc Interoffice Correspondence, dated March 12,1993

5 2 3 Safety Analysis Report for Building 779, dated June 1987

5 3 FACILITIES ENGINEERING RECORDS

5 3 1 Basic Information for the Decommissioning of Building 779

5 3 2 Facilities Engineering Drawings of the Building 779 Cluster

5 3 3 Facilities photographs from walk-downs conducted November 1996

5 4 FIRST-HAND PROCESS KNOWLEDGE INFORMATION

5 4 1 RFETS staff members previously/currently assigned to/or associated with the Building 779 Cluster

Process information on operations within the Building 779 Cluster was obtained from various individuals associated with the project A complete listing of persons contacted during the building characterization is available in the project files

6 0 REFERENCES

Building 779 Radiological Monitoring Contamination Survey Reports dated January 1990

Building 779 WSP BDP-779-003, Revision 0, Part A, September 9,1996

RFETS Glovebox Data List, dated October 1, 1996

Holdup Measurements Results for Building 779, Safe Sites of Colorado Interoffice Correspondence, dated September 27,1996

Summary of Building 779 Pu Holdup Breakdown by System, DKS-001-93, EG&G Rocky Flats, Inc Interoffice Correspondence, dated March 12,1993

Safety Analysis Report for Building 779, dated June 1987

Basic Information for the Decommissioning of Building 779

Facilities Engineering Drawings of the Building 779 Cluster

Facilities photographs from walk-downs conducted November 1996

Table 4-1 Building 779 Reconnaissance Characterization Table

Room No	Process Information	Radioactive and/or Hazardous Considerations	Confirmation Analysis
Area 1 - First Floor Rooms			
146	Office Area	N/A	Radiological Survey (RAD Survey)
147	This room was used for drum storage for rad waste It also supported Room 150 with nuclear joining	N/A	RAD Survey
149	Hallway	N/A	RAD Survey
150	Room 150 was used for nuclear joining of metal weapon components and for super critical C02 cleaning Cleaning and rinsing of the components were performed prior to the welding operation The process involved tungsten arc welders, electron beam welders, and torch brazing There are three hoods (150N, S, and W), which are uncontaminated This room should have minor contamination, if any at all	Hydrochloric, nitric, hydrofluoric, phosphoric oxalic, sulfuric acids, acetone, ethanol, copper sulfate, oils, alcohol, plutonium, uranium, and beryllium	RAD Survey Be Smears HAZ CAT For Acids And Solvents Liquids - Gross A/B - Finger Print
151	Office	N/A	RAD Survey
152	Room 152 was used as an experimental casting lab to test metal compatibilities with graphite mold substrates Plutonium and non nuclear metals are heated until molten and poured into graphite molds The molds were then examined and analyzed There is a vault on the north end of the room and it has not been used for material storage for many years There is a power generator located south of Glovebox 208 Due to its age, it is thought that PCBs may be contained within it There is contamination in the NW corner of the room	Plutonium, uranium, graphite, carbon, calcium fluoride, tantalum, and freon	RAD Survey PCBs Liquids - Gross A/B - Finger Print
153	This room is used for drum storage for rad waste and contains a trash compactor	Radioactive Contaminants	RAD Survey
153A	This room has a compactor for hot waste, a lead drum shield, two bottles, and three abandoned pumps This room appears to have been used for drum storage at one time	Radioactive Contaminants	RAD Survey
153B	This room has a downdraft table used to repackage waste The room is posted as respiratory protection required	Radioactive Contaminants	RAD Survey

Table 4-1 Building 779 Reconnaissance Characterization Table

Room No	Process Information	Radioactive and/or Hazardous Considerations	Confirmation Analysis
154	This room was used for hydriding and dehydriding of plutonium from substrates Hydride could still be present in the glovebox system Glovebox 1363 and 1364 is where hydriding/dehydriding was accomplished	Plutonium, Sulfuric Acid, Hydrochloric Acid, Nitric Acid, Tantulum, And Other Metals	RAD Survey HAZ CAT For Acids Liquids - Gross A/B - Finger Print
155	This room was a plutonium sample-mounting laboratory supporting auger spectroscopy It had etching, polishing, a furnace, and B-boxes to pull samples out of line Hood 155 NE - This hood is used as a 90-day accumulation area (7792269) It has contained numerous chemicals There is possible transite (asbestos) lining the hood The hood is labeled "NO FISSILE MATERIAL ALLOWED "	Plutonium, organic solutions, orthophoric, and oxalic acids	RAD Survey HAZ CAT For Acids Liquids - Gross A/B - Finger Print
156	This room is the calorimeter room There are, besides the calorimeter, 2 large gas cylinders and two portable air handlers which are contaminated	Radioactive Contaminants	RAD Survey
157	Tensile Testing Lab Glovebox 222 - This glovebox was never placed into service It contains a tensile testing machine Glovebox 225 - This glovebox was never placed into service and has no gloves Glovebox 223 - This box is non-leadlined and houses a hot tensile testing machine There is a heat detection unit (old stacked-style storage rack) There is a supply line on the east end Glovebox 224 was used to prepare samples and is also contaminated Glovebox 226 - This glovebox is clean except for one 1-gal can and a few tools The airlock ledge inside the box has dust and items There are two filter housings located external to and above the glovebox	Plutonium, plutonium contaminated metals, isopropanol	RAD Survey HAZ CAT For Chemicals Liquids - Gross A/B - Finger Print
159	This is a permitted storage area for RCRA waste (unit 779-90 42) There are several drums stored here containing mixed residues	Residues	RAD Survey
160	This room was retrofitted in the early 1980s as a pyrochemical development facility Operations that took place in this room included DOR, ER, MSE, Salt Scrub, and other high temperature studies with plutonium and americium	Calcium Oxide, Magnesium Oxide, Magnesium Chloride, Sodium Chloride, Calcium Chloride	RAD Survey Liquids - Gross A/B - Finger Print PCBs

Table 4-1 Building 779 Reconnaissance Characterization Table

Room No	Process Information	Radioactive and/or Hazardous Considerations	Confirmation Analysis
160 (con't)	In 1985 there was a major stationary furnace breach in glovebox 865 which contaminated the entire room with plutonium and americium Smears taken immediately afterward from around the room measured at infinity It took an entire year to completely decontaminate the room Walls, floors, ceiling, and pipes were painted after decontamination to fix any contamination remaining There were reports of contamination in the ventilation system servicing the room which migrated into other adjacent rooms	Calcium Oxide, Magnesium Oxide, Magnesium Chloride, Sodium Chloride, Calcium Chloride	RAD Survey Liquids - Gross A/B - Finger Print PCBs
160A	Room 160A was a vault which contained SNM SNM was removed from this vault in 1996	RAD Contaminants	RAD Survey
161	Janitor Closet	N/A	RAD Survey
163	This room is currently being used for the storage of empty drums	N/A	RAD Survey
163A	Office	N/A	RAD Survey
164	Hallway (Airlock)	N/A	RAD Survey
165	Double Doors	N/A	RAD Survey
166	Entry Way	N/A	RAD Survey
167	Men's Locker Room	N/A	RAD Survey
167A	Men's Locker Room	N/A	RAD Survey
Area 2 - Second Floor Rooms			
215	Hallway (Airlock)	N/A	RAD Survey
216	Hallway	N/A	RAD Survey
217	Room 217 was part of Product Physical Chemistry which performed research and development studies for production support, product material surveillance, material research, and material compatibility studies Equipment - This room contains a contaminated auger and surface analysis ESCA This was attached to a relatively new (late 1980s) stainless steel, non-lead lined glovebox (Glovebox 330-371)	Plutonium, trichloroethane, freon, ethanol, and methanol	RAD Survey HAZ CAT For Solvents Liquids - Gross A/B - Finger Print

Table 4-1 Building 779 Reconnaissance Characterization Table

Room No	Process Information	Radioactive and/or Hazardous Considerations	Confirmation Analysis
218	Room 218 was part of Product Physical Chemistry which performed research and development studies for production support, product material surveillance, material research, and material compatibility studies	Plutonium, uranium, oils solvents, inks, trichloroethane, methanol, freon TF, and ethanol	RAD Survey HAZ CAT For Solvents Liquids - Gross A/B - Finger Print
219	Rest Room	N/A	RAD Survey
220	Metallurgy Lab Polymer Prep	Plutonium, uranium, oils solvents, inks, trichloroethane, methanol, freon TF, and ethanol	RAD Survey HAZ CAT For Solvents Liquids - Gross A/B - Finger Print
221	This room stored several lecture bottles of gases and a large gas cylinder at one time	N/A	RAD Survey
Room 221A, 274, 275 & 277	These rooms have miscellaneous furniture and equipment	N/A	RAD Survey
221B	There is a drum liner stored here with fixed contamination There is a lab jack which also has fixed contamination There is an uncontaminated vacuum system in the room	RAD Contaminants	RAD Survey
221C	Equipment Storage	N/A	RAD Survey
222	Room 222 was part of Product Physical Chemistry which performed research and development studies for production support, product material surveillance, material research, and material compatibility studies	Plutonium, uranium, oils solvents, inks, trichloroethane, methanol, freon TF, and ethanol	RAD Survey HAZ CAT For Solvents Liquids - Gross A/B - Finger Print
222A	Storage Room	N/A	RAD Survey
223	Room 223 was a coatings lab which coated uranium, beryllium, stainless steel, and aluminum parts with a thin layer of metal The basic process equipment used consisted of a vacuum camber, arc welder, vacuum pump, and associated water cooling equipment Hood 223-1 was used for beryllium coatings work The floor in front of the hood is contaminated and there is probably contamination in the exhaust line from the hood The hood is dirty inside and contains cans and beakers There is fixed contamination on the sink top next to the hood	Uranium, beryllium, aluminum, stainless steel, gold, platinum, palladium, vanadium, tantalum, yttrium, rhodium, nitric acid, and ethyl alcohol	RAD Survey Be Smears HAZ CAT For Solvents Liquids - Gross A/B - Finger Print - Total Metals

Table 4-1 Building 779 Reconnaissance Characterization Table

Room No	Process Information	Radioactive and/or Hazardous Considerations	Confirmation Analysis
223 (con't)	In the NW corner there is a heater attached to a vent Lead tape covers the holes in the south side of the heater cabinet There is fixed contamination on the front of the filters leading into the cabinet In the south center of the room is a vacuum coating furnace The inside of the furnace is open to the room through an open side port The furnace exhausts directly into the room so it is probably not contaminated inside There is contamination in the lab on the north wall with large vacuum systems on the east wall It is unclear if these systems are contaminated	Uranium, beryllium, aluminum, stainless steel, gold, platinum, palladium, vanadium, tantalum, yttrium, rhodium, nitric acid, and ethyl alcohol	RAD Survey Be Smears HAZ CAT For Solvents Liquids - Gross A/B - Finger Print - Total Metals
224	Decontamination Room	Radioactive Contaminants	RAD Survey
225	Room 225 was a coatings lab which coated uranium, beryllium, stainless steel, and aluminum parts with a thin layer of metal The basic process equipment used consisted of a vacuum camber, arc welder, vacuum pump, and associated water cooling equipment There is contamination on the NE cabinet There is a large vacuum This room was used for sample preparation for X-ray analyses, plutonium metallurgy, and tensile testing	Uranium, beryllium, aluminum, stainless steel, gold, platnum, palladium, vanadium, tantalum, yttrium, rhodium, and nitric acid	RAD Survey HAZ CAT For Metals And Acids
226	Stairway	Radioactive Contaminants	RAD Survey
228	This room was used for sample preparation for X-ray analysis, plutonium metallurgy, and tensile testing	Plutonium, uranium, oils, organic solvents, isopropanol, varsol, diamond paste, and freon TF	RAD Survey HAZ CAT For Solvents Liquids - Gross A/B - Finger Print
229	Office	N/A	RAD Survey
230	Office	N/A	RAD Survey
231	Office	N/A	RAD Survey
232	Office	N/A	RAD Survey
233	Office	N/A	RAD Survey

Table 4-1 Building 779 Reconnaissance Characterization Table

Room No	Process Information	Radioactive and/or Hazardous Considerations	Confirmation Analysis
234	Room 234 was part of the plutonium physical metallurgy research and development group which prepared and analyzed and collected various metallurgical samples	Plutonium, oils, organic solvents, isopropanol, nitric acid, hydrofluoric acid, carbon tetrachloride, diamond paste, and freon TF	RAD Survey HAZ CAT For Solvents And Acids Liquids - Gross A/B - Finger Print
234A	Room 234 was part of the plutonium physical metallurgy research and development group which prepared and analyzed various metallurgical samples The X-ray unit has been removed from room This room contains four empty drums and one empty overpack that was for a project that is no longer funded Yellow paint was painted on the floor to cover contamination	RAD Contaminants	RAD Survey
234B	This room was used as a dark room There is no contamination	N/A	RAD Survey
235	This room has a contaminated transmission electron microscope	RAD Contaminants	RAD Survey
273	This room has fixed contamination on a box of electrical connectors	RAD Contaminants	RAD Survey
274	Equipment Storage	N/A	RAD Survey
275	Equipment Storage	N/A	RAD Survey
277	Equipment Storage	N/A	RAD Survey
Area 3 - First and Second Floors			
123	This is the decontamination room and likely has contamination in the process drains leading from it	RAD Contaminants	RAD Survey Liquids - Gross AB - Finger Print
124	This is an Radiation Control Technician office	N/A	RAD Survey
125	This room is a Radiation Control Technician office This room also has radiation sources in storage in the NE corner	N/A	RAD Survey
128	This room is used for repair of radiation instruments Radiation sources are stored in this room	N/A	RAD Survey
130	Janitor Closet	N/A	RAD Survey

Table 4-1 Building 779 Reconnaissance Characterization Table

Room No	Process Information	Radioactive and/or Hazardous Considerations	Confirmation Analysis
B783 & Cooling Towers	Building 783 provides cooling water to Building 779 It is approximately sq ft and is constructed of aluminum, steel, and reinforced concrete There is no fire protection system associated with this facility The cooling towers themselves are constructed of metal and will require minimal deactivation effort	Asbestos	RAD Survey Liquids - Gross A/B - Finger Print Asbestos Survey